

### REMARKS

Applicants have carefully reviewed and considered the Office Action mailed on February 14, 2002, and the references cited therewith.

Claims 18, 21, and 27-28 are amended, claim 26 is canceled, and claims 31-36 are added; as a result, claims 18-25 and 27-36 are now pending in this application.

The amendments to the claims, and the newly submitted claims, are fully supported by the specification as originally filed, and no new matter has been added. The amendments are made to clarify the claims and are not intended to limit the scope of equivalents to which any claim element may be entitled. Applicants respectfully request reconsideration of the above-identified application in view of the amendments above and the remarks that follow.

### Information Disclosure Statement

Applicants respectfully request that a copy of the 1449 Form, listing all references that were submitted with the Information Disclosure Statement filed on February 21, 2001, marked as being considered and initialed by the Examiner, be returned with the next official communication.

### Rejections under §102

Claims 18-20 were rejected under 35 USC §102(b) as being anticipated by Mehr et al. (U.S. Patent No. 5,936,848).

The Mehr patent discloses an electronics package that includes a substrate, a via, and a solder ball. The substrate has first and second opposed surfaces. The via is located within the substrate and terminates at the first surface. The via defines an opening. The solder ball is at least partially located over the opening. The solder ball has a center line which is off center with respect to a center line of the via. (col. 1, line 29 through col. 2, line 5).

As seen in FIG. 3 of the Mehr patent, a solder mask 40 partially covers the surface of pad 24. (See also col. 2, lines 45-46.) Although not specifically mentioned in the Mehr patent, solder mask 40 aids in positioning the center line 46 of solder ball 44 off-center with respect to the channel center line 48.

Applicants note that the disclosure in the Mehr patent relates to the packaging of an integrated circuit on a package substrate and not to mounting an integrated circuit package upon a substrate such as a printed circuit board. Applicants do not agree that Mehr is analogous art, because the technical problems encountered when packaging an integrated circuit are very different from those encountered when mounting an integrated circuit package upon a printed circuit board.

Applicants' independent claim 18, as amended, contains a limitation that each solder ball adheres to a respective one of the lands and adheres to the entire respective land. In this embodiment, there is no solder mask material between the solder ball and the land. The metal of the land, and not a solder mask, defines the position of the solder ball relative to the via. A solder mask could be used in this embodiment; however, the solder mask would not cover any portion of the metal land. It is unnecessary to carefully align a solder mask to overlap a portion of the lands in this embodiment. Thus the overall complexity and cost of the manufacturing process can potentially be reduced, particularly as board features become increasingly dense.

For the above reasons, Applicants respectfully request that the rejection of claim 18 under 35 U.S.C. §102(b) should be withdrawn, and that claim 18 should be allowable.

Claims 19-20, which are directly or indirectly dependent upon claim 18, should also be allowable.

#### Rejections under §103

Claims 21-24 and 26-30 were rejected under 35 USC § 103(a) as being unpatentable over Sakemi et al. (U.S. Patent No. 5,489,750) in view of Mehr et al. (U.S. Patent No. 5,936,848).

Mehr was previously discussed above.

Sakemi discloses a method of mounting an electronic part with bumps on a circuit board (FIG. 8, described in col. 4, line 66 through col. 5, line 3).

Applicants' independent claims 21 and 28, as amended, each contain a limitation that each solder ball contacts substantially the entire land to the edge of the land. As pointed out earlier, Mehr does not disclose this limitation and, in fact, teaches away from this limitation, because Mehr discloses a solder mask between the solder ball and the land.

For the above reasons, Applicants respectfully request that the rejection of claims 21 and 28 under 35 U.S.C. § 103(a) should be withdrawn, and that claims 21 and 28 should be allowable.

Claims 22-23 and 27, which are directly or indirectly dependent upon claim 21, should also be allowable.

Claims 29-30, which are directly or indirectly dependent upon claim 28, should also be allowable.

Claim 25 was rejected under 35 USC § 103(a) as being unpatentable over Sakemi et al. (U.S. Patent No. 5,489,750) in view of Mehr et al. (U.S. Patent No. 5,936,848) and further in view of Sherman (U.S. Patent No. 5,784,262).

Mehr and Sakemi were discussed above.

Sherman discloses an arrangement of mounting pads on a substrate. Each pad is connected to a via through a narrow neck-like structure (FIG. 2A). The pad and via combination is referred to as a pad-through-hole combination (col. 4, line 7). FIG. 3 shows an arrangement of pad-through-hole combinations, in which groups of pad-through-hole combinations are oriented in different directions.

Claim 25 is dependent from independent claim 21, so claim 25 should be allowable for the reasons presented above.

Thus, Applicants respectfully request that the rejection of claim 25 under 35 U.S.C. §103(a) should be withdrawn.

Newly Submitted Claims 31-36

New claims 31-36 are submitted to provide coverage to which Applicants are entitled.

Claims 31-33 are dependent upon independent claim 18, and it is asserted that they are allowable for the reasons presented earlier.

Applicants' newly submitted independent claim 34 contains a limitation that each solder ball adheres to the entire land without any material intervening between the solder ball and the land. Thus claim 34 should be allowable for the reasons present earlier.

Newly submitted claims 35-36 are dependent upon independent claim 34, so they should also be allowable.

Documents Cited but Not Relied upon for this Office Action

Applicants need not respond to the assertion of pertinence stated for the references cited but not relied upon by the Office Action, because these references are not made part of the rejections in this Office Action. Applicants are expressly not admitting to this assertion and reserve the right to address the assertion should it form part of future rejections.

Conclusion

Applicants respectfully submit that claims 18-25 and 27-36 are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicants' attorney Walter W. Nielsen at 602/298-8920 or the below-signed attorney to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 13 day of May, 2002.

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